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A Summary of Current Program 7/1/67  
and Preliminary Report of Progress  
for 7/1/66 to 6/30/67

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STANDARDS AND RESEARCH DIVISION  
CURRENT SERIAL RECORDS  
of the  
STATISTICAL REPORTING SERVICE  
UNITED STATES DEPARTMENT OF AGRICULTURE  
and related work of the  
STATE AGRICULTURAL EXPERIMENT STATIONS

This progress report is primarily a tool for use of scientists and administrators in program coordination, development, and evaluation; and for use of advisory committees in program review and development of recommendations for future research programs.

The summaries of progress on USDA and cooperative research include some tentative results that have not been tested sufficiently to justify general release. Such findings, when adequately confirmed, will be released promptly through established channels. Because of this, the report is not intended for publication and should not be referred to in literature citations. Copies are distributed only to members of Department staff, advisory committee members, and others having special interest in the development of public agricultural research programs.

This report also includes a list of publications reporting results of USDA and cooperative research issued between July 1, 1966 and June 30, 1967. Current agricultural research findings are also published in the USDA publications, Agricultural Economics Research and Farm Index. This progress report was compiled in the Standards and Research Division, Statistical Reporting Service, United States Department of Agriculture, Washington, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE

Washington, D. C.  
July 1, 1967



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## INTRODUCTION

The Statistical Reporting Service administers crop and livestock estimating programs designed to provide current information about crop acreages and production, livestock numbers, and other statistics pertaining to the agricultural economy. The research activities of SRS are centered in the Special Surveys and the Research and Development Branches of the Standards and Research Division. Both Branches perform some service as well as research activities.

The Special Surveys Branch conducts research on the behavior, opinions, and preferences of consumers which affect their purchase and use of agricultural products or end products. These studies provide information of value in planning improved marketing of agricultural products, setting or revising grades and standards, and indicating areas requiring technical research to provide product qualities and characteristics which more closely satisfy consumer demand. The findings can be utilized to increase marketing and merchandizing efficiency all along the distribution line so that returns to producers can be improved and at the same time the satisfaction of consumers increased. The Special Surveys Branch also conducts research on reactions of agricultural programs and services which is designed to provide insights into measures which might be taken to increase their effectiveness.

The Research and Development Branch conducts research on sampling and survey methods as applied to the data collection activities of SRS, and development of techniques of statistical measurement applicable to substantive research.

The work of these Branches is being performed by a staff of about 22 professional employees. Part of the research is conducted by contract with private research organizations and cooperative agreements with land-grant colleges or producer and processor groups. On occasion, funds are transferred to the Division by other government agencies or farm organizations to finance special research studies undertaken at their request.

Some of the more noteworthy recent applications resulting from the research conducted by the Division are outlined below.

Results of studies conducted by the Special Surveys Branch on consumers' opinions of agriculturally-produced materials in various end uses have been used by natural fiber organizations to evaluate the position of cotton and wool in specific segments of the textile industry, and to encourage and guide private industry's efforts to improve the attributes of natural fibers so that they can compete more successfully with synthetics. In addition, each year the National Cotton Council of America bases a major portion of its promotion for consumers and retailers on these research results; these reports have also been used as standard examples in the market development program of Cotton Council International.

The results of a study acceptance by a panel of consumers of instant sweet-potato flakes, which were developed by the Southern Utilization Research and Development Division, ARS, indicated considerable commercial potential for the new product. This conclusion is similar to that drawn from the results of an earlier study to measure consumer's reactions to instant white potato flakes. The acceptance of the white flakes has been a major contributing factor to halting the downward trend of per capita potato consumption. Since the publication of the final results of the sweetpotato flakes survey, a number of processors have begun producing the sweetpotato flakes.

The Special Surveys Branch has also conducted a number of studies in cooperation with the Economic Research Service to evaluate the market potential for new or improved products developed by the USDA's Utilization Research Regional Laboratories. One of these projects indicated that a new super-concentrated apple juice, which was processed in such a way that the fruit juice aromas which would otherwise be lost were recovered, was well received by household consumers in a test market city. The firm that originally cooperated with the Department in the first market test of the new juice subsequently undertook production of the juice with some variations from the Eastern Utilization Research and Development Division's original process. Preference tests in the Special Surveys Branch's sensory evaluation laboratory indicated that the variant product was much less acceptable to consumers than juice prepared by the original process. Market tests of the variant product were discontinued pending further technical research on product improvement.

The improved survey methods developed by the Research and Development Branch are being put into operation by SRS as rapidly as resources will permit. In June 1967, the enumerative survey program was expanded to include all of the 48 conterminous States at an operating level. Objective yield surveys for corn and cotton were also conducted--corn in 30 States, and cotton in 14 States. The 1967 winter wheat survey included 15 States. The research program which produced the methodology for these surveys is coming into fruition through their incorporation into the operating program of SRS. Work is being continued both in survey methods and in objective yields.

## AREA NO. 1: CONSUMER ATTITUDES AND PREFERENCES

Problem. Domestic consumption of agricultural commodities depends on the behavior of some 190 million consumers. But, in our complex marketing economy, it has become almost impossible for consumers to discuss their preferences, opinions, satisfactions, and dissatisfactions with producers and marketers. Knowledge of consumer reactions to agricultural products is becoming increasingly important because we are in a period of rapid change: There is a growing challenge to farm products and farm income from a wide variety of competitive products of nonagricultural origin; there is a proliferation of mixtures, forms, processes, and other innovations affecting farm products; and that mistakes in developing, producing, and marketing farm products are costly not only to the farmer but to processors and handlers as well. An understanding of consumer reactions and the reasons behind them is essential to planning improvements in the production, marketing, and processing of agricultural products, developing educational programs, setting or revising grades or standards, evaluating new products developed by the Department's Utilization Laboratories, and identifying areas on which technical research should be focused to provide farm products in the forms and with the characteristics that will increase consumer acceptance and more closely satisfy consumer demand.

### USDA PROGRAM

The Special Surveys Branch provides the consumer, in a scientific and unbiased manner, with an opportunity to say what he or she thinks about agricultural products by conducting applied research among representative samples of household, industrial, or institutional consumers and potential consumers. Such research may determine opinions, preferences, buying practices, knowledge and habits with respect to various agricultural commodities, the role of competitive products, and acceptance of new or improved agricultural products. The Branch also operates a sensory evaluation laboratory designed for small-group experiments in taste and visual preference and discrimination in which people's reactions to various products can be ascertained under controlled conditions. Such research applies to grades and standards problems and marketing problems as well as product development or product improvement efforts. These studies of the reactions of consumers which affect their purchase and use of farm products provide a line of communication from consumers back to those concerned with production and marketing, and are complementary to the marketing and economic research of the Economic Research Service and the Consumer and Marketing Service as well as to the utilization research of the Agricultural Research Service.

In addition, the Branch provides consultants and conducts special studies, upon request, for other agencies in the USDA or within the Federal Government, when survey methods can be usefully applied to the evaluation of programs, services, or regulatory procedures of interest to the requesting agencies. The research is carried out in cooperation with other USDA or

Federal agencies, state departments of agriculture, experiment stations, land-grant colleges, and agricultural producer, processor, and distributor groups. Closely supervised contracts with private research firms are used for nationwide surveys; studies in selected areas are sometimes conducted by the Washington staff with the assistance of locally recruited personnel.

The Branch maintains all of its research scientists, who are trained in social psychology or other social sciences, in Washington, D. C., which is headquarters for all the research whether it is conducted under contract or directly by the Branch. The Federal effort devoted to research in this area during the past year totaled seven scientist man-years.

#### REPORT OF PROGRESS FOR USDA AND COOPERATIVE PROGRAMS

1. Pork and Beef. A study is being conducted among a nationwide sample of homemakers to ascertain their opinions, usage patterns, and purchasing practices for various meats and meat products, particularly pork and beef. The National Live Stock and Meat Board is cooperating with the Department on this study, and is providing a portion of the funds for the contract.

An exploratory study preceded the main survey in an effort to assure that pertinent factors would not be overlooked in developing the questionnaire. The questionnaire is oriented toward uncovering some of the reasons that underlie increased per capita consumption of beef on one hand and decreasing consumption of pork on the other. The interviewing on the main survey started early in calendar 1967, and will cover all quarters of that year. A preliminary report, based on some of the more pertinent findings from the first quarter's interviews, should be available early in 1968.

2. Materials in shoe uppers. A survey is being conducted in the Philadelphia, Pa., area to ascertain the attitudes and opinions of consumers concerning leather, primarily in shoe uppers. The study, in which approximately 500 men and 500 women will be interviewed, will investigate consumers' opinions about the advantages and disadvantages of leather compared to competing synthetic products, and their impressions of the desirability of potential improvements in leather for shoes. If necessary, additional interviews will be conducted among users of "Corfam" shoes in an effort to obtain a large enough number for separate analysis. Attitudes toward leather in clothing are also being studied, again in comparison with competing synthetics currently on the market. Questionnaire development and pre-testing have been completed; interviewing is scheduled for the fall of 1967.

3. Dry Whole Milk. The final report is being prepared for publication on a study (financed in part by ARS) to evaluate consumer acceptance of a powdered dry whole milk developed by the Dairy Products Laboratory of the Eastern Utilization Research and Development Division, ARS.

The new powdered milk, which reconstitutes into fluid whole milk, was tested by a sample of over three hundred households in the Alexandria, Virginia area. Considering over-all needs and preferences, the dry whole milk was rated equal to or better than fresh whole milk by four out of ten of the participating homemakers. About three-fourths of the homemakers found advantages to the dry whole milk - the most frequently mentioned advantage was that it was lightweight and easy to store; the most frequently mentioned disadvantage was that the test milk takes time to prepare or mix.

Tentative plans were made for conducting a consumer survey phase as part of a market test in cooperation with ERS-MED to further investigate acceptance of vacuum foam dry whole milk.

A year long series of experiments conducted to test people's reactions to dry whole milk after varying periods of time in storage at different temperatures ( $40^{\circ}$ ,  $68^{\circ}$ , &  $80^{\circ}$ , Fahrenheit) has been completed. The milk that had been stored at the three temperatures was compared to a fresh whole milk which served as the control throughout the tests. Mean score ratings for the two samples which had been stored at  $68^{\circ}$  and  $80^{\circ}$ F., decreased steadily each month; they were dropped from the series after eight months of tests due to increased difficulty in reconstitution. However, the mean scores for the dry whole milk that had been stored at  $40^{\circ}$  remained fairly constant during this period, and even after a year in storage the mean score for the dry whole milk that had been stored at  $40^{\circ}$ F., was still above the neutral point (5.00) on the hedonic scale.

4. Citrus. A contract has been signed with a private research firm to gather information from a nationwide sample of homemakers on their experiences, beliefs, attitudes, and criticisms of citrus and citrus products, as well as the impact of synthetic products on their attitudes toward natural fruit products. Small-scale exploratory activity will be conducted prior to the main survey to assure that major issues related to attitudes toward the purchase and use of citrus fruit products that might otherwise be overlooked or distorted are covered in the full-scale survey, or at least identified for consideration. The citrus fruits currently being considered for coverage in the questionnaire are oranges, grapefruit, and lemons. The field work on the main survey is tentatively planned for either February or March of 1968.

5. Grapefruit & Orange Juice Crystals. A study is underway to evaluate consumer acceptance of foam-mat dried grapefruit juice crystals, and to provide insights into the measures which might be taken to market crystals effectively. The research is being financed in part by ARS. The test product was supplied by ARS's Fruit and Vegetable Products Laboratory, Winter Haven, Florida. The crystals are made from real grapefruit and are reconstituted into grapefruit juice by adding water.

Data were collected during May and June, 1967 from a sample of private households in the Pittsburgh, Pa., area. Sweetened and unsweetened grapefruit juice crystals were alternately placed in about 200 households where the homemakers indicated that they had used grapefruit juice and 200 households where they had not used grapefruit juice in the preceding six months. A second placement - sweetened in the households where unsweetened had been placed and vice versa - was made about a week later so that each participating family had an opportunity to evaluate both versions of the product. The survey investigated areas such as: reasons for use or non-use of grapefruit juice; opinions of the advantages and disadvantages of canned and frozen concentrate grapefruit juice; advantages and disadvantages assumed from a description of the test product; satisfactions and dissatisfactions with both types of the test product after testing it; and opinions about ease of reconstitution. Coding of the data is currently in process. Some preliminary data from this study may be released during the fall of 1967; a final report on the findings will be published in 1968.

In addition, experiments were conducted in the sensory evaluation laboratory on grapefruit juice crystals. Tests were run on the grapefruit juice crystals, a commercial canned single strength juice, and a commercial frozen concentrate; it was found that the flavor of the latter two rated higher than the flavor of the crystals. Another experiment was designed to determine which peel oil level was preferred so that it could be used in the product prepared for the household placement study.

Experiments were also conducted on orange juice crystals provided by the Winter Haven Fruit and Vegetable Products Laboratory to determine reactions to the juice when different percentages of peel oil are added. The first series of experiments, which was conducted with four peel oil levels (.015%, .020%, .025%, & .030%) indicated that higher levels might be acceptable. Therefore, a second series of experiments was conducted with three higher peel oil levels (.040%, .050%, .060%) and the .030% level from the previous tests so that the results of the two series might be compared. The results of these experiments indicate that none of the peel oil levels was too high to be preferred under sensory evaluation laboratory conditions.

6. Three fruit juices. Laboratory experiments were conducted to determine relative preference for three fruit juices--cherry, grape, and apple--reconstituted from powders manufactured by two different processes. These tests had been requested to verify the results of tests done at Michigan State University. Although the procedures used in our laboratory were different from those used at M.S.U., the results were similar and the conclusions were the same.

7. Potatoes, Rice & Wheat. The coding and tabulating of data from a nationwide study collecting information from homemakers on their use of and opinions about selected potato, rice, and wheat products have been completed, and a final report is being prepared for publication in 1968.

8. Fibers in Wearing Apparel. A nationwide study of women's attitudes toward cotton and other fibers used in wearing apparel has been completed, and the final report is being readied for the printers. Some highlights of the findings follow: While there are important variations in the purchase requirements that apply to the different clothing items, women (as might be expected) generally consider color, style and fit in any clothing purchased. For summer dresses and between-seasons dressed, comfort and weight along with ease of care are the next most important considerations. However, there is less focus on ease of care and more concern with multiseasonal use and whether the garment is appropriate for many occasions in selecting between-seasons dresses.

In purchasing warm-weather knit dresses, warm-weather suits, and skirts, interest centers on shape retention and warm weather comfort. For blouses and slips, care and laundering are the next most important factors.

In response to a question on how long they expected their garments to last, the majority of the women interviewed said they wanted to get at least two or three seasons use out of them. When asked how they cared for the specific garments included in the study, just as many women said they hand washed as well as machine washed summer dresses, skirts, blouses, and slips. Between-seasons dresses, knit dresses and warm-weather suits are dry cleaned by the majority of the women interviewed.

According to these women's responses, cotton was still the dominant fiber with respect to ownership and preference among the items studied, with the exception of slips where nylon is the leader.

Cotton implies a number of important benefits. It is cited for its good appearance and fit characteristics. It is cool and lightweight and also offers easy care features. For most end uses, respondents mentioned rayon and nylon as the least liked fiber. They were both faulted for fraying and pulling at the seams, for being difficult to iron, and clinging to the body. Many women said that nylon was warm. Rayon, on the other hand, was thought to be cheap looking, wrinkled easily, and lost its shape.

Respondents were questioned on three special fabrics: stretch fabrics, machine washable woolens, and wash and wear. About one out of four women said they owned a summer garment made of a stretch fabric. The main attribute given for these garments is their comfortable fit. Cotton, because it is cool and washable, is the fiber most women preferred in a stretch garment for summer use.

About half of the respondents said they were aware of machine-washable wool; however, only one-tenth owned a garment made of this fabric. Those who said they owned garments that were made of machine-washable wool said they were easy and economical to care for, but did not keep their shape.

About three out of four women owned wash and wear clothes. Cotton-and-synthetic blends are preferred for wash and wear largely because of their reduced ironing needs, wrinkle-resistance, and quick-drying qualities.

A contract has recently been signed with the private research firm which conducted the women's clothing study cited above to conduct supplemental analyses on these data. This additional research will expand insights into the issues that underlie women's fiber preferences in specific clothing items through a detailed examination of the interrelationships among the reasons given for fiber preferences as well as general attitudes toward fibers. It will be of value in interpreting data already collected as well as in planning future studies.

PUBLICATIONS

- Clayton, L. Yvonne. 1966. Homemakers' Use of and Opinions About Selected Fruits and Fruit Products. Marketing Research Report No. 765 (S&R 3-6)
- Knott, Edward M. 1966. Homemakers' Opinions and Preferences for Broiler-Fryers and Turkeys. Marketing Research Report No. 760 (S&R 3-8)

## AREA NO. 2: IMPROVEMENT OF CROP AND LIVESTOCK ESTIMATING PROCEDURES

Problem. The Statistical Reporting Service prepares a large number of official estimates for agricultural and related enterprises. These statistics are published in the more than 700 reports issued each year. The critical need for precision estimates for the agricultural economy makes it imperative that modern statistical theory and methods be developed and incorporated into the collection and analyses of agricultural statistics. Many new techniques have been developed and introduced into the estimating procedures. However, owing to the changing structure of agriculture, the development of new technologies and the demand for more and better statistics there is an urgent need for continued research and study to devise more efficient sample survey methods to insure continued improvement in the quality of SRS statistics.

### USDA PROGRAM

The Statistical Reporting Service conducts a program of applied research designed to strengthen and improve the methodology used in collecting agricultural statistics. The principal disciplines involved are mathematics, statistics and probability but other disciplines relating to a particular subject or field are employed as required. Examples of these subjects are plant physiology, psychology, cartography and photogrammetry. The current program consists of 6.0 professional man-years per year devoted to the study of sampling techniques and survey methods, and 4.0 professional man-years working on methods for forecasting and estimating the yields of important crops. Work under this program is done in Washington, D. C., and in SRS field offices located in the States concerned.

The research objectives in survey methods are associated with the improvement of all aspects of survey design. These include questionnaire design, universe definition, sampling frame construction, sample design and estimators, enumeration techniques, quality checks, editing procedures, methods of processing data and the post-analysis of the survey data and procedures with a view to improvement of sampling and operational designs. In the current program priority is being given the investigation of sources of lists for farm operators and processors of agricultural products, maintenance and optimum use as sampling frames for probability sampling; and the problem of developing methodology for collecting data by mail and enumeration in the same sample survey, using lists in conjunction with area frames. An exploration of the possibility of using aerial photography in estimating acreages of crops and numbers of livestock is being made. In this area, problems requiring study are those of sample design and photo-interpretation as well as the use of this technique to supplement a general purpose sample survey. Response errors are being studied. Here the objective is to establish communication with the respondent through the medium of a questionnaire which will transmit concepts with a high degree of

fidelity and at the same time induce the respondent to reply honestly and fully to questions concerning agricultural activities. An attempt is being made to distinguish between those items for which the respondent has accurate knowledge, those items which he may have once known but no longer recalls accurately, those items which he has never known precisely, and those items for which he is unwilling to divulge information or gives deliberately misleading information. Where applicable, alternative sources of information will be sought and different ways of motivating respondent cooperation will be tested.

Work on objective yields is being continued. This includes the refinement of the forecasting models already in use as well as the development of new forecasting procedures for other crops. Corn, cotton, wheat, and soybean models are being refined by more detailed analysis of growth patterns and fruit development. The use of ADP for computing parameters based upon larger samples and for broadening the range of plant maturity recognized by the forecasting models has strengthened early season forecasts of yield. Among the other crops for which objective forecasting procedures are being developed are apples, potatoes, and hay.

#### A. Crop Yield Forecasting and Estimation

1. Wheat. To discover additional factors that may be useful in the forecasting models, especially for early season forecasts, intensive observations were made in eight winter wheat fields, four each in Oklahoma and in Oregon, during the 1966 spring growing season. Two sample plots, each divided into three subplots, were located in each field. One subplot was used for making weekly observations, and another was used as a check plot to determine the effect of the weekly observations on the plants subjected to that regime. The third subplot was used for clipping stalks for laboratory analysis. Information was also obtained for several environmental factors including variety, fertilizer applications, rate of seeding, amount and time of irrigation, soil moisture, soil type, and soil fertility.

Analysis of the data show that: 1. The productivity of plots subjected to weekly handling is not significantly different from the check plots. 2. A more efficient estimate of the average weight per head could be obtained by taking a 5 head sample from each of 2 sample units in each field rather than by following the current procedure of a single 10 head sample from only one of the two units.

Additional work will be conducted during the 1967 growing season, particularly with respect to possible correlation between the size of the flag leaf and weight of grain per head and with methods of measuring soil moisture.

2. Soybeans. In 1966 the 11 States previously in the Objective Yield Program were allocated 1,200 samples for monthly pre-harvest information and 815 samples for post-harvest information. In addition, 4 new States, North Carolina, South Carolina, Tennessee and Louisiana allocated 350 samples for a

single pre-harvest visit and 173 samples for post-harvest information. Five weekly samples each were assigned to Maryland-Delaware, Virginia, North Carolina, South Carolina, Kentucky, Tennessee and Louisiana.

Pre-harvest acreage information was obtained by interview for all of the 1550 samples in 15 States. Enumerators made counts of various plant characteristics during the survey period for 814 samples in August, 1081 samples in September, 1058 samples in October and 465 samples in November. Final pre-harvest counts were made for 1085 samples in the 11 States and 264 samples in the four States.

Analysis work aimed at improving the forecast model continued. A major component in the model is the average pod weight. Statistical analysis produced some insight into the sources of variation of average weight of beans per pod. Varieties that have common ancestors tend to have similar pod weights while variety groups arising from different ancestors tend to differ in average pod weight. Where Harosoy is the predominant variety, it is heavier than the average of the other varieties. Varieties grown in Northern States have heavier pods than varieties grown in the Southern States. Plant maturity on a given date as determined by maturity category, is associated with harvest weight of beans per pod. Maturity category definitions were changed based upon the analysis of the weekly sample data. The number of categories remains at 11, but classification is based upon plant relationships (such as nodes per plant, fruiting positions, ratio of pods to fruit, ratio of pods with beans to total pods) as well as field conditions (leaves turning yellow, leaves falling, plants mature). Included in the definition of mature plants (category 11) for the first time is the requirement that pods must be brown and ready to combine.

Oil and protein content determinations were made on 1242 samples of beans picked at the time final pre-harvest observations were made. These data were published in the December 1966 "Crop Production". Analysis of the data shows no correlation between yield and protein content but there appears to be an inverse relationship between oil content and protein content.

3. Hay Forage. A study of hay forage yield forecasting techniques was made on ten selected farms in two counties in Iowa. Observations were made in one field of alfalfa or alfalfa mixture for hay on each farm. Three pre-harvest visits were made to each field. These were timed respectively, at four weeks before, two weeks before, and immediately before the expected harvest date. On each pre-harvest visit, forage harvested from 10 randomly located plots, each 30" by 20', was weighed, dried, and reweighed. Actual production less harvesting loss was obtained for each field by counting the total number of bales and weighing a sample of the bales.

4. Apples. Studies were begun during the spring of 1967 to evaluate the efficiency of various methods of sampling limbs within trees and to explore the use of photography in limb sampling and in fruit estimation.

A sample of trees was selected in an orchard in Northern Virginia and photographs were taken in early spring while the trees were dormant. Various positions and camera-film combinations were investigated. In June these sample trees were "mapped", (all possible sample limbs were identified) and fruit on the entire tree was counted. The data from the mapped trees are being used to evaluate the efficiency of several methods of sample limb selection. These data along with the early spring photographs are also being used to explore procedures for making sample limb selections on photography. This procedure would allow some selection methods to be used which are not practical in field sampling.

Photographs of the sample trees were taken in June after the fruit was large enough to be easily visible. Sample limbs were selected and counted. Tags of various designs and colors were placed on the counted limbs. These photographs are being used to explore the feasibility of using counts from them in conjunction with field counts in a ratio estimate of fruit on the tree. The sample trees will again be photographed when the fruit is near maturity to evaluate the effect of fruit size and maturity on its visibility. The fruit from the sample trees will be counted and weighed at harvest to determine actual production from the trees.

The extension of the same techniques to other deciduous fruit is being investigated.

#### B. Survey Methods

1. Area Frame Construction. The construction of a new area sampling frame was completed for Texas. Total land area of the State was classified according to its current usage on the basis of aerial photography and irrigation studies of the Soil Conservation Service. The primary strata identified were: (1) Intensive agriculture, with sub-strata based on amount of current or expected irrigation; (2) Extensive agriculture; (3) Land used primarily for urban, business, or industrial purposes; (4) Range or grazing land; (5) Land of marginal productivity in the agricultural sense. This category also included any known non-agricultural areas. Reported segment data from the June 1966 Survey were used to calculate expected variances which served as the basis for the allocation of the 1967 sample. Based on this allocation, 475 segments were selected in 7 of the 15 crop reporting districts, (approximately half the land area of the State) and were enumerated for the first time in June 1967. The remaining 375 segments have been selected and will be used for the first time in the June 1968 Survey, thus completing the selection of the new sample.

The number of segments in the June Enumerative Survey was raised to operational level in Washington, Oregon, California and the New England States.

Because of a previously determined need for control of segment size, based on factors other than size in square miles, the land area of Stratum I

(intensively cultivated land) in Pennsylvania was broken into count units of approximately uniform size. Within these a count of dwellings and of farms was recorded from the culture showing on county highway maps. These counts will eventually be used in the assignment of sampling units to count units.

2. Aerial Photography as a Supplementary Technique in Making Crop and Livestock Estimates. The results of the June 1966 experimental survey in the Sacramento Valley of California indicated that: (1) larger scale photography was needed, (2) better ground truth should be obtained, (3) better air to ground communication was needed and (4) smaller and more frequent flight areas should be flown. With these results in mind a survey was conducted in April of 1967 in the Sacramento Valley.

The April 1967 Survey embodied about 1000 square miles. This area was stratified into two areas of nearly equal size designated as rangeland and cultivated land. Thirty-two segments were selected in the entire area with sixteen segments in each stratum. The range segments contained about three square miles each. The cultivated segments were drawn to be about one square mile. Half of these segments were used as drawn. In the remainder of the cultivated segments one-half mile flight paths were mapped along cardinal directions and one flight path was selected. Thus, the size of these segments was restricted to the area contained in the flight path. Associated with each cultivated segment was a five mile flight strip, i. e., the segment was contained in a path five miles long by the width of the segment.

All 32 segments were to be enumerated just a few days prior to the date of the aerial photography. Weather conditions complicated this endeavor and the time lapse was greater than anticipated. The data collected from the ground enumeration was used to place each field in one of four domains based on the type of ground cover the field contained. A sample of fields was selected from each domain. Enumerators equipped with radios were placed in or as near as possible to the selected fields to locate and count the livestock in the fields at the time of the aerial photography. This phase was an attempt to provide data for a field by field comparison of the photo interpretation and the ground truth data under the four different types of ground cover.

All segments were photographed from an elevation of about 2500 feet using a Zeiss aerial camera with a six inch focal length lens. A scale of 1:5000 was obtained with a 60 percent forward overlap per photo to provide stereoscopic viewing. A conventional Wratter 12 (minus blue) filter was used. In a second hatch in the airplane, a 70 millimeter camera was mounted, with a 14 inch focal length lens. At the altitude flown, a scale of 1:2140 was obtained with a 20 per cent forward overlap which was used to insure complete coverage with non-stereo color transparencies. The 70 millimeter photography provided an 18 per cent subsample of two randomly selected flight paths in each range segment and of each cultivated segment flight

path. The 70 millimeter photography was used in an attempt to collect truth by a means other than ground enumeration. The analysis of the 1967 California Aerial Photo Livestock Survey is underway but is not yet completed.

Also in late June of 1967 an aerial photography survey was conducted in Tippecanoe County, Indiana in cooperation with Purdue University. Twenty-five segments were randomly selected for ground enumeration in Tippecanoe County. Weather did not permit complete photographic coverage. The development of crop identification keys as well as livestock keys was of interest in this study. Analysis is not complete.

3. Lists As Sampling Frames. Two techniques for building lists of farm operators were investigated in Iowa, one technique for producers of minor items and one for general list of farm operators. Methods of optimumly using list were studied in Illinois, Tennessee, Oklahoma and New Mexico.

a. Lists of farm operators producing items found on less than 10 percent of all farms were developed based upon the following procedure. A questionnaire was mailed to a sample of names from an available partial list of probable producers of the item of interest. The questionnaire determined whether or not the respondent was a producer and also asked the respondent to list other known producers in the area. New list members found in the response to the questionnaire were similarly interviewed and the "snowballing" was carried on for two rounds.

The minor items considered and the areas studied were turkey raisers in Southeast Iowa, beekeepers in Northeast Iowa and sorghum raisers in Southeast Iowa. Sources of the initial lists used were the subscribers to Turkey World magazine, a list of beekeepers obtained from the Iowa State apiarist, and a sample of the farmers reporting sorghum on the 1965 Iowa assessors census. The estimated number of producers after two rounds was increased over the original list by 73, 32 and 84 percent, respectively, for turkey, bee and sorghum producers. Although the available check data on the number of producers in the three universes is quite limited, the application of this technique results in lists of producers which appear to be nearly complete.

A large proportion of farmers receive their mail by rural route carrier. The possibility of developing a sampling frame having cities as primary sampling units, rural routes based in the cities as second stage sampling units, and farmers receiving mail on the routes as third stage sampling units was being considered. It is possible to draw the first and second stage sampling units quite easily and cheaply. Limited studies indicate that the route boxholders may be screened for the presence or absence of certain farm characteristics at fairly low cost. A mail route covering a variety of farm types and conditions appears to be an efficient second stage sampling unit. Problems in the use of such a sampling frame need to be identified and solved in future work.

b. In Illinois, Tennessee, Oklahoma and New Mexico investigations were made of all available sources of livestock producer lists. Some of the lists which appeared best suited for sampling and estimation were obtained. Lists of cattle, sheep and poultry producers were tested in December 1966 and June 1967.

In the December 1966 study, samples of about 500 names per specie list were selected in each of the four states. Two mailings of a questionnaire which defined the sampling unit as the land operated and asked inventory members of the specie present on the land were sent. Response rates varied from 36 to 56 per cent which was considered a good return rate. Improvement was needed in the design of the questionnaire since many respondents were unable to complete the section which defines the sampling unit. This involves listing and properly combining acres owned, rented, managed, jointly operated, rented out, etc., to arrive at the acres operated by the respondent. The design of the questionnaires was modified prior to the field experiment in June 1967.

The questionnaires returned by mail contained reported information for other persons associated with the operator, such as, landlords, tenants and managers. Samples of these "other names" were selected and one mailing of the same questionnaire was made. This was done to see whether two persons involved in a rental or managerial arrangement on a particular parcel of land would report it approximately the same way. Of the 305 returns from this supplemental mailing, about 28 percent reported a different number of acres for the parcel of land rented or managed as compared with the report of the first respondent. Some personal interviewing was done to find reasons for those differences exceeding 10 per cent. In many cases the respondent's ideas of the meaning of terms used such as rented, leased, managed and partnership was incorrect and discrepancies occurred. Many of reported partnerships and operations with a hired manager appeared to be rather informal family arrangements.

Generally the December 1966 work suggested that the lists obtained were suitable for sampling in the multiple frame sense although no list obtained was complete enough for use alone. Limited experience gained in interviewing farmers by telephone rather than in person was considered promising.

More elaborate field experiments were carried out in the same four states in June 1967. Objectives were to gain more experience in using the lists, to evaluate the lists as incomplete sampling frames, and to demonstrate the effectiveness of multiple frame sampling methods in estimating livestock numbers with improved precision when compared to a single frame estimate. Analyses of this experiment are not completed.

LINE PROJECT CHECK LIST--Reporting Year July 1, 1966 to June 30, 1967

Work & Line Project Number	: Work and Line Project Titles	: Work Locations During Past Year	: Line Proj. Summary of Progress	Incl. in Area & Sub-heading
S&R 3	: Household and Industrial Consumer : Attitudes and Sensory Discrimi- nation Studies.	:	:	:
S&R 3-9	: Consumer Interest in Retail Avail- ability of Ripe Winter Pears.	: Wash., D.C.	No	:
S&R 3-10	: Women's Attitudes Toward Cotton and: Other Fibers Used in Wearing Apparel.	: Wash., D.C.	Yes	1-8
S&R 3-11	: Laboratory Sensory Evaluation of Agricultural Commodities.	: Wash., D.C.	Yes	1-3,5,6
S&R 3-12	: Consumer Preferences, Usages, and Buying Practices for Selected Types of Potato, Rice, and Wheat Products	: Wash., D.C.	Yes	1-7
S&R 3-13	: Consumer Acceptance of Dry Whole Milk.	: Wash., D.C.	Yes	1-3
S&R 3-14	: Consumer Preferences, Usages, and Buying Practices for Pork and Beef.	: Wash., D.C.	Yes	1-1
S&R 3-15(C)	: Consumer Preferences in Materials in Shoes.	: Wash., D.C.	Yes	1-2
S&R 3-16(C)	: Consumer Acceptance of Foam-Mat Dried Grapefruit Juice Crystals.	: Wash., D.C.	Yes	1-5
S&R 3-17(C)	: Homemakers Preferences, Usages, and Buying Practices for Selected: Citrus and Citrus Products*	: Wash., D.C.	Yes	1-4
E9-SRS-1(a)	: Projects Financed by P.L. 480 Funds: Received Through ARS	:	:	
	: Factors of Food Selection Other Than Nutritional and Palatabil- ity, i.e., Psychological Factors of Food Preferences and Consump- tion.	: France	No	:

\*Initiated during reporting year.

LINE PROJECT CHECK LIST--Reporting Year July 1, 1966 to June 30, 1967

Work & Line Project Number	Work and Line Project Titles	Work Locations During Past Year	Line Project Summary of Progress	Incl. In Area & Sub-heading
S&R 4	:Improvement of Crop and Livestock :Estimation Methods.	:	:	:
SGR 4-1	:Studies on the relationship of :individual cuttings of hay to the :total hay production and techniques :for building lists of farm operators: :for probability surveys.	:	:	2-A-3
SGR 4-5	:Development of improved forecasts :and estimates of wheat yields. : : :	:Ames, Iowa :Wash., D.C. & :State Offices: :in Okla. & :Oregon	:Yes	and 2-B-3
SGR 4-6	:Development of improved forecasts :and estimates of soybean yields. : :	:Wash., D.C. & :State Offices: :in 23 States	:Yes	2-A-1
SGR 4-8	:Improvement of yield forecasts on :sour cherries and apples through :objective fruit counts and :measurements.	:Wash., D.C. & :State offices: :in Mich., & :Va.	:Yes	2-A-2
SGR 4-12	:The study of lists of farm operators: :as sampling frames for collecting :agricultural statistics. : :	:Wash., D.C. & :State Offices: :in Ill., Tenn. :Okla., & N.M.	:Yes	2-A-4
SGR 4-13	:Study of response and other non- :sampling errors.	:Wash., D. C.	:No	2-B-3
SGR 4-14	:Study of aerial photography as a :supplementary survey technique in :making crop and livestock estimates. : :	:Wash., D.C. & :State Offices: :in Calif., & :Ind.	:Yes	2-B-2
SGR 4-15	:Development of improved sample :survey procedures for crop and live- :stock estimates. : :	:Wash., D.C. & :State Offices: :in Texas	:Yes	2-B-1



